ON *TYLODINA CORTICALIS* (Tate), A RARE OPISTHOBRANCH FROM SOUTH-EASTERN AUSTRALIA

By ROBERT BURN.*

Tylodina corticalis (Tate 1889, pp. 65-66) is a rare south-eastern Australian opisthobranch gastropod. Its discovery in the living state is unusual; the time of the year during which it has been found alive (March-April) apparently corresponding to the breeding period. It has a vertical range from the littoral and sub-littoral to 7-16 fathoms (Tate, loc. cit.) to 30 fathoms (Bass Strait trawlings: specimens in the collection of Mrs. D. I. Hartley, Melbourne).

The recent finding of two living specimens allows a fuller description of both shell and animal to be compiled. The writer must express his thanks to Miss F. V. Murray, of Melbourne, for making available the larger of the two specimens, and to Miss J. H. Macpherson, National Museum of Victoria, Melbourne, for the loan of a series of kodachrome slides made from this specimen while alive.

TYLODINA CORTICALIS (Tate, 1889).

Umbrella corticalis Tate 1889, p. 65, pl. 11, fig. 11.
Umbraculum corticalis Cotton and Godfrey 1933, p. 97, pl. 1, fig. 22.
Umbraculum corticalis Macpherson and Chapple 1951, p. 140.
Tylodina corticalis Burn 1959, p. 28, fig. *d*.

The larger living specimen (Text fig. 1) was 50 mm. long, about 35 mm. broad, and 12 mm. high; preserved it is 20 mm. long, 15 mm. broad, and 10 mm. high. The smaller specimen alive was 22 mm. long, 11.5 mm. broad, and 5 mm. high; preserved it is 10.5 mm. long, 8 mm. broad, and 5.5 mm. high. The shell covers only the gill, the basal parts of the rhinophores and the body or visceral hump; the foot protrudes in front and behind; the head with the eyes and oral tentacles extends forward over the anterior foot.

The whole animal is either ochraceous yellow or brilliant lemon yellow. The interstices of the foot patterning are whitish; the anterior edges of the foot, the rhinophores and the skin over the pharyngeal bulb are orange. The mantle is pale creamy-yellow, darker at the margins. The sides of the body are white; the gill is yellow. In both alcohol and phenoxotol preservatives, the yellow pigment of the skin precipitated, and the animals are now drab blue-gray or purple; this corresponds to Tate's statement (1889, p. 66) that the "animal is of a deep port-wine colour".

The shells (Text figs. 4, 5) are very broadly oval in shape and nearly flattened. Inclusive of the periostracum they measure respectively 29 x 25 x 3.5 mm. and 12.5 x 11 x 2.7 mm. in length, breadth and height. The shell proper in each case measures 19 x 16 x 2 mm. and 8.5 x 7 x 1.3 mm., and is very thin and fragile with razor-sharp edges. The corneous periostracum is thin about the protoconch and thick at the margins; it spreads completely over the shell and extends well beyond it, but not as far as Tate (loc. cit. p. 65) indicated. There are thirteen radial ridges on the larger shell and eleven on the smaller one; Tate (loc.

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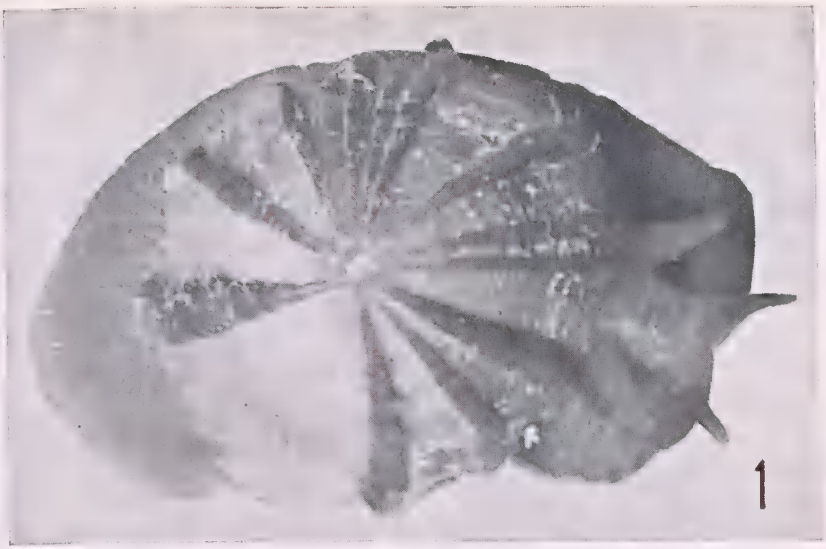
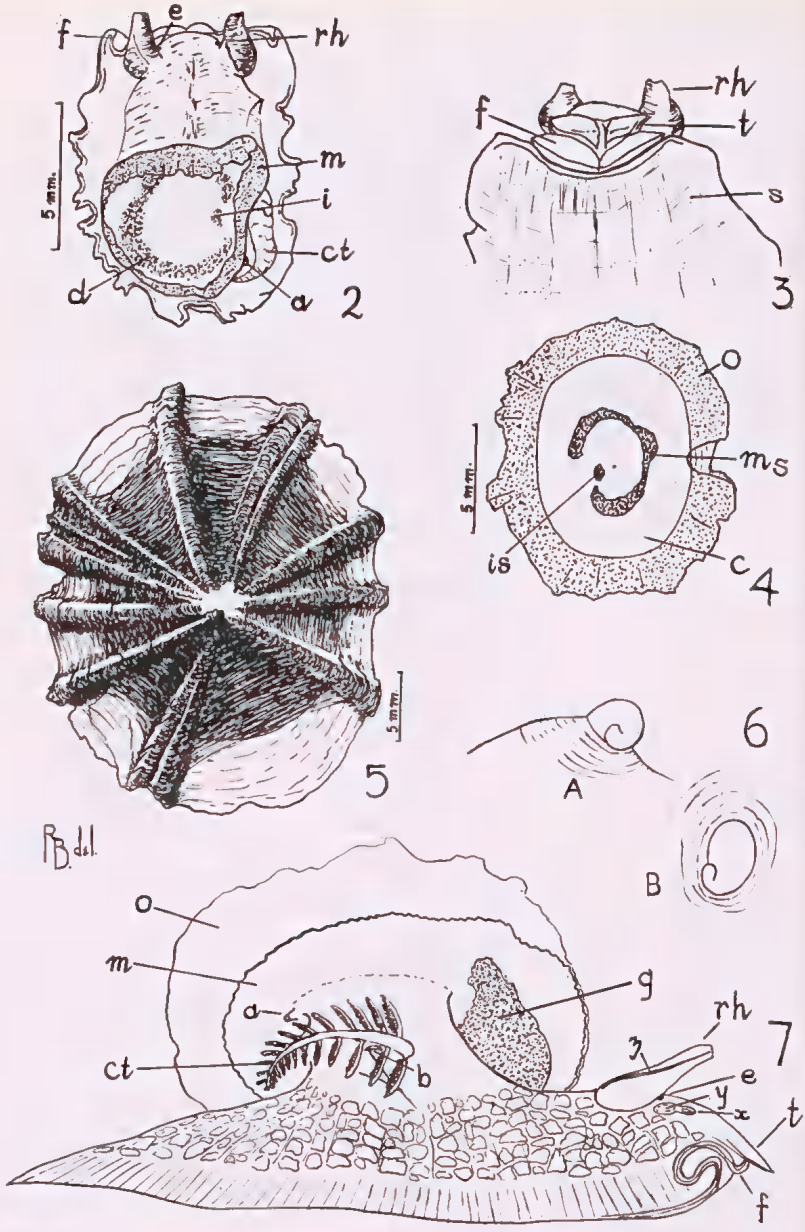


Text fig. 1.

Tylodina corticalis (Tate). Photograph of living specimen. (Nat. Mus. Vic. No. F21276). (x 2).

cit., p. 65) indicated "about 20 broad rays" on the type. The ridges are dark brown and are hollow on the undersides at the margins, but are built up and filled in before the shell proper is reached. The dorsal sides of the ridges bear a few (3-8) simple spurs or horns representing rest periods during growth. The periostracum contains a number of sand grains in its structural composition; it is pale red-brown in colour. The shell proper shows through the periostracum as an olive-green area; ventrally it is nacreous; within the muscle scars it is yellow; the scars are silver or translucent and the remainder is white. The protoconch (Text fig. 6) comprises 1½ whorls; it is sinistral, white and entirely smooth; it measures about 0.4 mm. long and 0.25 mm. broad.

The anterior border of the foot is thickened and carries a shallow groove within the thickening; it is notched in the mid-line; the anterior folds (*f*) are characteristic of the species. At the level of the genital apertures the foot turns upwards for a short way, then folds backwards, upwards and forwards until it curls downwards under the oral tentacles. Ventrally, the anterior part of the sole is shallowly concave, and this concavity is filled with the thickened anterior of the foot. The sole of the foot (*s*) is longitudinally striated with shallow muscular furrows. The tail is flat and broadly rounded behind. The foot marginal surface has very low raised lines which radiate out from the body: inside this lined area the skin is raised into low scale-like plates which more or less form lines in conjunction with the marginal raised lines.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Text figs. 2-7.

The mantle (*m*) is thin and tough, with edges thickened and nodular; its surfaces are entirely smooth; Tate (loc. cit., p. 66) records small white carunculae on the underside (these are possibly the result of some infestation of marine parasites). When expanded the mantle reaches to the edge of the periostracum. Contained in the mantle in front of the body is a large chocolate-brown crescent-shaped gland (*g*) which is here termed the pre-mantle gland. The anterior edge of this gland is thick, while near the body it is thin and patchy. No secretions from the gland were observed in the living animals. The rhinophores (*rh*) are large and distinctive; their bases are narrow, as are the tips, while mid-laterally they are swollen and slit (*z*). The eyes (*e*) are black and are situated in front of and between the rhinophores. The oral tentacles (*t*) are short, narrow and latero-ventrally slit; on the median side they meet in a shallow notch between two tumid swellings. The genital apertures are contiguous; the larger female one (*y*) is behind the smaller male one (*x*), and they are situated on the ridge between the rhinophore and oral tentacle on the right side.

The gill (*ct*) is a very elegant plume originating high up under the mantle about half way along the right side of the body. There are twelve alternately placed pinnae each side of the smooth rounded gill rhachis. Each pinna has ten or twelve minute short pairs of whitish feather-like pinnulae. The gill is attached for about half its length; in the larger preserved specimen it is 15 mm. long and is attached for 8 mm.; in the smaller specimen it is 4.2 mm. long and is attached for 1.8 mm. The anus (*a*) opens at the top of a short stout papilla above and behind the junction of the gill attachment and the body wall. Below the anterior of the gill rhachis is a deep cleft or indentation in the body wall, at the anterior top of which is a slit-like opening into a shallow cavity (*b*), the sub-branchial aperture, which is probably analogous with the pre-branchial aperture (of Bourne's gland) of the Pleurobranchacea. The columella muscle (*d*) of the visceral hump shows as a glossy pad around the black viscera, and there is a small flatly triangular intermediate suspensor muscle (*i*) on the right side at the level of the gill. The columellar muscle forms an incomplete ring around the visceral hump, there being a short gap between either end of it and the suspensor muscle (Text fig. 4 *is*, *ms*, and Burn 1959, fig. *d*, both show these gaps between the muscles, but in reverse as the undersides of the shells are figured).

Text figs. 2-7.

2. Smaller preserved animal from above: shell removed.

3. Anterior part of same specimen as fig. 2 from below.

4. Smaller shell from below.

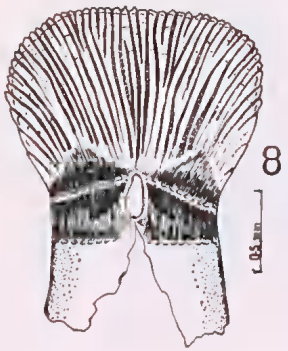
5. Larger shell from above.

6. Protoconch of Aust. Mus. specimen No. C.62263. A, left lateral side. B, from above.

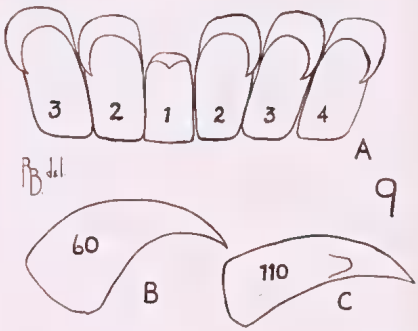
7. Sketch of living animal from right side.

a, anus. *b*, sub-branchial aperture. *c*, shell proper. *ct*, gill. *d*, columellar muscle. *e*, eye. *f*, anterior folds of foot. *g*, pre-mantle gland. *i*, intermediate suspensor muscle. *is*, intermediate suspensor muscle scar. *m*, mantle. *ms*, columellar muscle scar, *o*, epidermis. *rh*, rhinophore. *s*, sole of foot. *t*, oral tentacle. *m*, male aperture. *y*, female aperture. *z*, rhinophoral slit.

The pharyngeal bulb of the smaller specimen only was examined; it measures 3.6 mm. long, 2.4 mm. broad, and 3 mm. high. There is a small, thin jaw plate (Text fig. 8) present in front of the radula measuring 2 mm. in height, the upper pale purple part of which is rounded and fan-shaped with approximately 42 denticulations (muscle hold-fasts) spread evenly along the upper margin. From between these denticulations run shallow furrows in irregular converging courses towards the smooth-edged mouth-opening which is between two thickened purple parts, each with an upper and lower nodular ridge. The radula (Text fig. 9) is pale orange in colour, and is 3.9 mm. long and 1.8 mm. broad; the formula is 84 x 130.1.130. The rhachidian (*1*) is smaller than its laterals (*2, 3, 4*), although there is very little difference in shape. Each tooth has a single cusp with a small flange-like denticle on the inner side which articulates with the cusp of the next. The half rows of teeth meet at the rhachidian in a near straight line, which is as Odhner states for *T. rafinesquei* = *T. citrina* (1939, p. 15).



Text fig. 8.
Jaw plate.



Text fig. 9. Radular teeth. (x 325).
A. Rhachidian and immediate laterals.
B. Lateral tooth from outer side.
C. Outer lateral tooth from inner side.

The genital organs have not been examined.

Occurrence and *Localities:* One specimen (Nat. Mus. Vic. F21275) crawling on weed in a deep rock pool at the outer edge of the reef, Ocean Beach, Flinders, Victoria, 20/3/1960, coll. R. Burn; one specimen (Nat. Mus. Vic. F21276) left on rock platform by receding tide, Ocean Beach, Portsea, Victoria, 3/4/1960, coll. Miss F. V. Murray. Both specimens have been presented to the National Museum of Victoria, Melbourne.

Discussion: The known range of *T. corticalis* is from the gulfs of South Australia eastwards through Victoria and northwards to Sydney Harbour, N.S.W. A specimen in the Australian Museum, Sydney (No. C.62263) provides the first record of the species from that State, and also the most northerly record to date. It was "taken alive off Sydney (? Heads) by skin-divers, January, 1957"; no other information is available. The protoconch illustrated in Text fig. 6 is that of this specimen.

That this species is a *Tylodina* is beyond doubt, the examination of the animal validating the author's earlier arguments (Burn 1959, pp. 28-29) for this generic placement. The criteria used by Odhner (1939, pp. 14-15) to differentiate between *Tylodina* Rafinesque, 1819, and *Tylodinella* Mazzarelli, 1897, when applied to *corticalis* Tate indicate clearly that it belongs to *Tylodina,* and not *Tylodinella.* Briefly these criteria of *Tylodina* are: (1) animal larger than shell and not capable of retraction within it, (2) eyes in front of level of rhinophores and not behind them, (3) presence of rhachidian in radula, and (4) articulation of teeth instead of separation, and (5) presence of an intermediate suspensor muscle between the ends of the columellar muscle.

There are at least three valid species of *Tylodina* throughout the world. They are *T. corticalis* described above, *T. citrina* (Joannis) the type of the genus from western Europe, north-western Africa and the Mediterranean, and *T. fungina* Gabb from California. *T. corticalis* is very similar in the shape of the shell and in the animal to *T. citrina,* but the radial ridges of the periostracum and a different radular formula in the former, appear to separate the two species. *T. fungina* has not been anatomically described to date other than for the figure of the shell muscle scars (Burn 1959, fig. *c*).

Tylodina alfredensis Turton, 1932, from Port Alfred, South Africa, is placed in this genus after examining the muscle scars visible in the type photograph; these scars hardly differ in shape from those of *T. corticalis,* and if the animal could be compared with the present species it might prove to be identical.

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